

Exhibit 1



Curriculum vitae

NAME: Leonid Anatolievich Yakubov

ADDRESS: 450 Byberry Road, apt. T1, Philadelphia, PA 19116. Phone: 215 9698296

E-mails: yakubov@hotmail.com; yakubovl@yahoo.com.

MARITAL STATUS: Married, two children

EDUCATION:

1968-1974 Student, Biology Department, Novosibirsk State University, Biochemistry major.

1985-1988 Post-Graduate Student, Novosibirsk Institute of Bioorganic Chemistry, Siberian Division, Academy of Sciences of Russia

1989, Ph.D. Thesis "Interaction of alkylating oligonucleotide derivatives with mammalian cells and their inhibition of the tick-borne encephalitis virus multiplication", in Novosibirsk Institute of Bioorganic Chemistry, Academy of Sciences of USSR. Thesis advisor: Professor Valentin V. Vlassov

CURRENT RESEARCH INTERESTS

Mechanisms of genomic management in somatic cells and their role in biological processes in the organism.

EXPERIENCE

1974-1976: Graduate student, Institute of Cytology and Genetics, Siberian Division of USSR Academy of Sciences, Novosibirsk.

1976-1985: Junior Sci. Researcher, All-Union Scientific Research Institute of Molecular Biology, State Department of Microbiological Industry, Koltsovo (Novosibirsk region)

1985-1988: Post-Graduate Student, Novosibirsk Institute of Bioorganic Chemistry, Siberian Division of Russian Academy of Sciences.

1988-1991: Research Scientist, Novosibirsk Institute of Bioorganic Chemistry of Siberian Division of Russian Academy of Sciences.

1991-1999, Senior Scientist, Group Leader, Laboratory of Biochemistry of Nucleic Acids, Novosibirsk Institute of Bioorganic Chemistry of Siberian Division of Russian Academy of Sciences, 8 Lavrentiev Ave., Novosibirsk 630090, Russia.

1990-1997: (part time) Visiting Scientist at College of Physicians and Surgeons at Columbia University (New York), Division of Medical Oncology, Dr. C. A. Stein laboratory (NCI/NIH awards).

1999-2000, Research Associate, Thomas Jefferson University, Department of Microbiology and Immunology (Philadelphia, PA).

CURRENT POSITION:

2000- present, President of Panagenic International Inc., 2935 Byberry Road, #206, Hatboro, PA 19040. Telephone/fax 215-443-8550. E-mail: panagenic@cs.com; yakubovl@yahoo.com; yakubov@hotmail.com

GRANTS:

Co-principal investigator, grant of the Russian governmental program Fundamental Research, "Nucleic acids binding receptors in cells and organism", 1991-1995.

Principal investigator, grant of the program Priority Directions of Genetics, 1991-1994.

Principal investigator, grant of the International Science Foundation, New York (Soros Fund), "Fate of Free Nucleic Acids in Animal Organism: Penetration into Cells, Possible Involvement in Regulation and Pathology", 1994-1995.

Principal investigator 1997-1999: Russian Foundation for Fundamental Research Grant "Transportation of nucleic acids across biological barriers".

Principal investigator 1997 Gene Therapy Program Grant (Russian)

AWARDS

1994-1996, Russian President's Award for "Outstanding Scientist of Russia",.

1999, **State Prize of Russian Federation** and Golden Medal in the field of science and technology for the work "Derivatives of oligonucleotides are biologically active substances and research tools for nucleo-protein interactions". The highest national prize in science in Russia.

TEACHING EXPERIENCE

Three Ph. D. dissertations were successfully produced in Dr. Yakubov's group under his supervision. Three students were awarded their Ph.D.s in his group: 1993, Valery N. Karamyshev (now at NIH, Bethesda, MD); 1994, Marina V. Nechaeva (now at New York Medical College, Valhalla, NY) and 1999, Olga E. Shestova (now at Thomas Jefferson University).

SOCIETY MEMBERSHIPS

Member of American Association for Cancer Research since 1994.

Member of Russian Biochemical Society

PUBLICATIONS and CITATIONS

List of publications consists of 47 papers. Number of citations of these papers by other authors exceeds 700.

Author of 3 US patents, pending.

OTHER INTERESTS:

Mountain climbing, hiking. Climbed over 50 peaks and passes (the highest 6200 m above sea level) at the Pamirs, Tien Shang, Altai, Rocky Mts, etc.

BIBLIOGRAPHY

1. Shkutina, F.M., Yakubov, L.A. and Berdnikov, V.A. "Subfraction composition of the lysine-rich histone during interaction of genomes from different forms of *Triticinae*", *Genetika*, (1977), 13, 1517-1523.
2. Yakubov, L.A., Savich, I.M. and Beklemishev, A.B. "Purification of neuraminidase from influenza virus on an immunosorbent", *Biokhimiya*, (1984), 49, 1588-1593.
3. Vlassov, V.V., Gorokhova, O., Ivanova, E.M., Kutyavin, I.V., Yurchenko, L.A., Yakubov, L.A., Abdukayumov, M.N. and Skoblov, Y.S. "Interaction of alkylating oligonucleotide derivatives with mouse fibroblasts", *Biopolimery i Kletka*, (1986), 2, 323-327.
4. Belyaev, N.D., Vlassov, V.V., Kobets, N.D., Ivanova, E.M., Yakubov, L.A. "Complementary-addressed modification of DNA in metaphase chromosomes and interphase chromatin." *Doklady Akad. Nauk USSR* (1986), 291, 234-236.
5. Pogodina, V.V., Frolova, T.V., Abramova, T.V., Vlassov, V.V., Ivanova, E.M., Kutyavin, I.V., Pletnev, A.G. and Yakubov, L.A. "Oligonucleotide derivatives complementary to tick-borne encephalitis virus RNA inhibit the virus multiplication in cell culture", *Dokl. Akad. Nauk. USSR*, (1988), 301, 1257-1260.
6. Vlassov, V.V., Ivanova, E.M., Krendelev, Y.D., Kutyavin, I.V., Ovander, M.N., Ryte, A.S., Svinarchuk, F.P. and Yakubov, L.A. "Sendai virus envelopes and erythrocyte ghosts as membrane vehicles for transport of reactive oligonucleotide derivatives in cells." *Biopolimery i Kletka*, (1989), 86, 6454-6458.
7. Pogodina, V.V., Frolova, T.V., Frolova, M.P., Abramova, T.V., Vlassov, V.V., Knorre, D.G., Pletnev, A.G. and Yakubov, L.A. "Oligonucleotides complementary to tick-borne encephalitis virus RNA inhibit development of infection in mice", *Dokl. Akad. Nauk. USSR*, (1989), 308, 237-240.
8. Butorin, A.S., Vlassov, V.V., Ivanova, E.M., Ryte, A.S., Shishkina, I.G., Yurchenko, L.V., Yakubov, L.A. "Binding of alkylating oligonucleotide derivatives with cells in presence of additions which stimulate transfection." *Biopolimery i Kletka* (1989), 5, 71-75.
9. * Yakubov, L. A., Deeva, E. A., Zarytova, V. F., Ivanova, E. M., Ryte, A. S. Yurchenko, L. A. and Vlassov, V.V. "Mechanisms of oligonucleotide uptake by cells: Involvement of specific receptors?", *Proc. Natl. Acad. Sci. USA* (1989), 86, 6454-6458.
10. Vlassov, V.V., Deeva, E. A., Yakubov, L.A. "Possible participation of specific receptors in nucleic acids transportation into cells.", *Doklady Acad. Nauk USSR* (1989), 308, 998-1000.
11. Vlassov, V.V., Ivanova, E.M., Kutyavin, I.V., Ryte, A.S., Yurchenko, L.V., Yakubov, L.A., Abdukayumov, M.N., Skoblov, Y.S. "Interaction of alkylating oligonucleotide derivatives with mammalian cells: Investigation of mechanisms of the cellular uptake." *Molekularnaya Biologiya* (1989), 23, 93-100.
12. Vlassov, V.V., Kobets, N.D., Chernolovskaya, E., Ivanova, E.M., Subbotin, V.M., Yakubov, L.A. "Affinity modification of chromatin by alkylating hexadecadesoxyribithymidin derivative." *Biopolimery i Kletka* (1989), 5, 49-53.
13. Belyavskaya, N.A., Kvetkova, E.A., Yakubov, L.A. "Experimental therapy of acute lethal tick-borne encephalitis." *Priruchnitsa po bolezni cheloveka* (1990), Republican collection of Ministry of Health of Russian Federation, 48-53.
14. Vlassov, V.V., Yakubov, L.A., Deeva, E.A., Nechaeva, M.N., and Rykova, E.N. "Interaction of oligonucleotide derivatives with animal cells", *Nucleosides and Nucleotides*, (1991), 10, 581-582.
15. Bazanova, E.M., Yakubov, L.A., Vlassov, V.V., Zarytova, V.F., Ivanova, E.M., Kuligina, E.A., Abdukayumov, M.N., Karamyshev, V.N., and Zon, G. "Oligonucleotide derivatives in organism: distribution among organs, rates of release and degradation", *Nucleosides and Nucleotides*, (1991), 10, 523-526.

16. Stein, C.A., Zhung, L.M., Tonkinson, J. and Yakubov, L.A. "Mode of uptake of 5'-cholesteryl-linked phosphodiester oligodeoxynucleotides in HL-60 cells", *Nucleic Acids Res., Symposium Series*, (1991), 24, 155-156.
17. Yakubov, L.A., Yurchenko, L.A., Nechaeva, M.N., Rykova, E.N., Karamyshev, V.N., Tonkinson, J., Vlassov, V.V., and Stein, C.A. "Interaction of oligonucleotides with cellular receptors", *Nucleic Acids Res., Symposium Series*, (1991), 24, 311.
18. Vlassov, V.V. and Yakubov, L.A. "Oligonucleotides in Cells and Organisms: Pharmacological Considerations" In: "Prospects for Antisense Nucleic Acids Therapy of Cancer and AIDS" E. Wikstrom ed., Willey Liss Inc., New York, (1991) p.243-266.
19. Yakubov, L.A., Karamyshev, V.N., Vlassov, V.V., Savinkova, I.V., Scherbakov, D.Yu. "Oligonucleotide binding proteins of *Drosophila*: properties and tissue specificity". *Molekularnaya Biologiya* (1991), 25, 1611-1614.
20. Stein, C.A., Tonkinson, J.L. and Yakubov, L.A. "Phosphorothioate oligonucleotides - antisense inhibitors of gene expression?", *Pharmacology and Therapeutics*, (1992), 52, 265-384.
21. Yakubov, L.A., Stein, C.A., Zhang, L.M., Vlassov, V.V. "Interaction of oligonucleotides with recombinant CD4 receptor." *Doklady Akad. Nauk of Russia*, (1992), 337, 593-597.
22. Karamyshev, V.N., Vlassov, V.V., Zon, G., Ivanova, E.M., Yakubov, L.A. "Distribution and stability of oligonucleotide derivatives in mouse tissues." *Biokhimiya*, (1993), 58, 590-598.
23. Vlassov, V.V., Pautova, L.V., Rykova, E.Yu., Yakubov, L.A. "Interaction of oligonucleotides with blood serum proteins." *Biokhimiya*, (1993), 58, 1247-1251.
24. Vlassov, V.V., Nechaeva, M.N., Rykova, E.Yu., Karamyshev, V.N., Yakubov, L. A. "Affinity modification of nucleic acids binding proteins on mammalian cells by alkylating derivatives of oligonucleotides." *Biokhimiya*, (1993), 58, 962-966.
25. Stein, C.A., Tonkinson, J.L., Zhang, L.M., Yakubov, L.A., Gervasoni, J., Taub, R., Rotenberg, S.A. "Dynamics of the internalization of phosphodiester oligodeoxynucleotides in HL60 cells", *Biochemistry* (1993), 32, 4855-4861.
26. Krieg, A.M., Tonkinson, J., Matson, S., Zhao, Q., Saxon, M., Zhang, L.M., Bhanja, U., Yakubov, L.A., Stein, C.A. "Modification of antisense phosphodiester oligodeoxynucleotides by a 5' cholesteryl moiety increases cellular association and improves efficacy", *Proc. Natl. Acad. Sci. USA*, (1993), 90, 1048-1052.
27. Stein, C.A., Cleary, A.M., Yakubov, L.A., Lederman, S. "Phosphorothioate oligodeoxynucleotides bind to the third variable loop domain (V3) of HIV-1 gp 120." *Antisense Res. Devel.*, (1993), 3, 19-31.
28. Yakubov, L.A., Khaled, Z., Zhang, L.M., Truney A., Vlassov V.V., and Stein C.A. "Oligodeoxynucleotides interact with recombinant CD4 at multiple sites." *J. Biol. Chem.* (1993), 268, 18818-18823.
29. Vlassov, V.V., Karamyshev, V.N., Yakubov, L.A. "Penetration of oligonucleotides into mouse organism through mucosa and skin". *FEBS lett.* (1993), 327, 271-274.
30. Vlassov, V.V., Balakireva, L.A., Yakubov, L.A. "Transport of oligonucleotides across natural and model membranes." *Biochim. Biophys. Acta* (1994), N 1197, 95-108.
31. Vlassov, V.V., Nechaeva, M.V., Karamyshev, V.N., Yakubov, L.A. "Iontophoretic delivery of oligonucleotide derivatives into mouse mammary gland tumor." *Antisense Res. Devel.* (1994), 4, 291-293.
32. Rykova, E.Y., Pautova, L.V., Yakubov, L.A., Karamyshev, V.N., Vlassov, V.V. Serum immunoglobulins interact with oligonucleotides." *FEBS Lett.* (1994), 344, 96-98.
33. Pautova, L.V., Laktionov, P.P., Rykova, E.Yu., Yakubov, L.A., Vlassov, V.V. "Analysis of oligonucleotide binding site on immunoglobulin molecule." *Mol. Biologiya* (1994), 28, 1106-1112.

34. Tonkinson, J.L., Guvakova, M., Khaled, Z., Lee, J., Yakubov, L., Marshall, W.S., Caruthers, M.H., Stein, C.A. "Cellular pharmacology and protein binding of phosphoromonothioate and phosphorodithioate oligonucleotides - a comparative study." *Antisense Res. Devel.* (1994), 4, 269-278.
35. Vlassov, V.V., Yakubov, L.A., Karamyshev, V.N., Pautova, L., Rykova, E. and Nechaeva, M. "In vivo pharmacokinetics of oligonucleotides following administration by different routes" in: *Delivery strategies for antisense oligonucleotide therapeutics*. S. Akhtar ed., CRC press (1995), 71-83.
36. Guvakova, M.A., Yakubov, L.A., Vlodavsky, I., Tonkinson, J.L., Stein, C.A. "Phosphorothioate oligonucleotides bind to basic fibroblast growth factor, inhibit its binding to cell surface receptors, and remove it from low affinity binding sites on extracellular matrix." *J. Biol. Chem.* (1995), 270, 2620-2627.
37. Kit, Yu.Ya., Yakubov, L.A., Richter, V.A., Vlassov, V.V. "Phosphorylation of rsCD4 receptor in presence of human blood cells and plasma." *Doklady Akademii Nauk of Russia*, (1995) 340, N3.
38. Vlassov, V.V., Nechaeva, M.V., Baiborodin, S.I., Shestova, O.E., Safronov, I.V., Koshkin, A.A., Yakubov, L.A. "Oligonucleotides absorbed by cells rapidly accumulate in nuclei." *Doklady Akademii Nauk of Russia* (1995), 345, 123-126.
39. Yakubov, V.V., Plasunova, O.A., Fedjuk, N.V., Pokrovsky, A.G., Vlassov, V.V. "Inhibition of HIV multiplication by anionic dyes" *Doklady Akademii Nauk of Russia*, (1996), 347, 696-698.
40. Lederman, S., Sullivan, G., Benimetskaya, L., Lowy, I., Land, K., Khaled, Z., Cleary, A.M., Yakubov, L., Stein, C.A. "Polydeoxyguanine motifs in a 12-mer phosphothioate oligodeoxynucleotide augment binding to the V3 loop of HIV-1 gp120 and potency of HIV-1 inhibition independently of G-tetrad formation." *Antisense & Nucl. Acid Drug Devel.* (1996), 6, 281-289.
41. Yakubov, L.A., Andreeva, A.Y., Karamyshev, V.N., Vlassov, V.V. "Isolation and properties of a kidney nucleic acid binding protein". *Doklady Akademii Nauk Russia* (1996), 350, N3, 414-417.
42. Yakubov, L.A., Kit, Y.Y., Richter, V.A., Andreeva, A.Y., Karamyshev, V.N., Stein, C.A., Vlassov, V.V. "The extracellular domain of CD4 receptor possesses a protein kinase activity." *FEBS lett.* (1998), 431, 45-48.
43. Yakubov, L.A., Shestova, O.E., Andreyeva, A.Y., Vlassov, V.V. "Participation of specific cell surface proteins in nucleic acids trafficking into cell." *Doklady Akademii Nauk Russia* (1998), 361, 550-553.
44. Kuligina, E.V., Andreeva, A.Y., Mogelnitskii, A.S., Kit, Y.Y., Yakubov, L.A., Richter, V.A., Vlassov, V.V. "Oligonucleotides and oligonucleotide-binding proteins of human fluids." *Doklady Akademii Nauk Russia* (1999) 364, 832-834.
45. Shestova, O.E., Andreeva, A.Y., Vlassov, V.V., Yakubov, L.A. "Transportation of complexes of oligonucleotides with cell surface proteins into cell nucleus. *Doklady Akademii Nauk Russia* (1999), 368, 264-267.
46. Yakubov, L.A., Petrova N.A., Popova N.A., Semenov D., Nikolin, V.P., Oskina, I.N. "Role of extracellular DNA in maintaining stability and variability of cellular genomes." *Doklady Akademii Nauk* (2002), 382, 405-410. English translation: *Doklady Biochem Biophys* (2002), 382, 31-34.
47. Yakubov, L.A., Popova, N.A., Nikolin, V.P., Semenov, D.V., Bogachev, S.S., and Oskina, I.N. "Extracellular genomic DNA protects mice against radiation and chemical mutagens." *Journal of Biology* (submitted).